

What is claimed is:

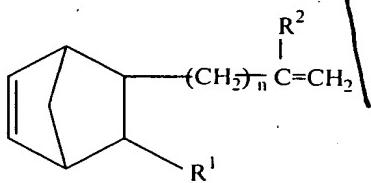
1. A crosslinkable rubber composition, which is crosslinkable by hot air and has the following properties:
- 5 a crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then subjecting the sheet to hot-air crosslinking has no scratch on the surface in a pencil hardness test using a pencil of HB and has a compression set (CS) of not more than 70 %
- 10 after a heat treatment at 150°C for 22 hours.

2. The crosslinkable rubber composition as claimed in claim 1, which comprises:

an ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) having constituent units derived from at least one kind of a vinyl end group-containing norbornene compound represented by the following formula (I) or (II), said norbornene compound being the non-conjugated polyene, and

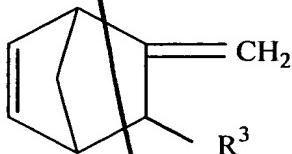
- 20 a SiH group-containing compound (B) having at least two SiH groups in one molecule;

see page 91



(I)

wherein n is an integer of 0 to 10, R¹ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R² is a
5 hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



(II)

10 wherein R³ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms.

3. The crosslinkable rubber composition as claimed in claim 2, which comprises the ethylene/α-olefin/non-
15 conjugated polyene random copolymer rubber (A), the SiH group-containing compound (B) having at least two SiH groups in one molecule, and a catalyst (E).

4. The crosslinkable rubber composition as claimed
20 in claim 2, which comprises the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A), the SiH group-containing compound (B) having at least two SiH

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groups in one molecule, a catalyst (E) and a reaction inhibitor (F).

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5. The crosslinkable rubber composition as claimed in any one of claims 2 to 4, wherein the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

10 (i) the molar ratio (ethylene/ α -olefin) of ethylene to an α -olefin of 3 to 20 carbon atoms is in the range of 40/60 to 95/5,

15 (ii) the iodine value is in the range of 0.5 to 50, and

(iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 10 dl/g.

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6. The crosslinkable rubber composition as claimed in claim 5, wherein the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) has, in addition to the properties (i), (ii) and (iii), the following properties:

20 (iv) the molecular weight distribution (Mw/Mn) as measured by GPC is in the range of 3 to 50, and

25 (v) the effective network chain density (v) as measured after the copolymer rubber (A) is press crosslinked at 170°C for 10 minutes using 0.01 mol of

dicumyl peroxide based on 100 g of the copolymer rubber (A) is not less than 1.5×10^{20} chains/cm³.

- Sabatini*
7. The crosslinkable rubber composition as claimed
5 in claim 6, wherein the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) has, in addition to the properties (i), (ii), (iii), (iv) and (v), the following properties:
10 (vi) the ratio between a ratio (γ_2/γ_1) of a shear rate γ_2 at a shear stress of 2.4×10^6 dyn/cm² obtained from the melt flow curve at 100°C to a shear rate γ_1 at a shear stress of 0.4×10^6 dyn/cm² obtained from the melt flow curve at 100°C and the effective network chain density (v) satisfies the following formula (III):
15 $0.04 \times 10^{-19} \leq \log(\gamma_2/\gamma_1)/v \leq 0.20 \times 10^{-19}$ (III).

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8. The crosslinkable rubber composition as claimed in any one of claims 2 to 7, wherein the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) is obtained by copolymerizing ethylene, an α-olefin and the norbornene compound represented by the formula (I) or (II) using a catalyst containing the following compounds (J) and (K) as main components under the conditions of a polymerization temperature of 30 to 60°C, a
25 polymerization pressure of 4 to 12 kgf/cm² and a feed

rate molar ratio (non-conjugated polyene/ethylene) of the non-conjugated polyene to ethylene ranging from 0.01 to 0.2;

5 (J) a soluble vanadium compound represented by $VO(OR)_nX_{3-n}$ (R is a hydrocarbon group, X is a halogen atom, and n is 0 or an integer of 1 to 3), or a vanadium compound represented by VX_4 (X is a halogen atom);

10 (K) an organoaluminum compound represented by $R'^mAlX'^{3-m}$ (R' is a hydrocarbon group, X' is a halogen atom, and m is an integer of 1 to 3).

9. The crosslinkable rubber composition as claimed in claim 8, wherein the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) has an insoluble content of not more than 1 % after Soxhlet extraction (solvent: boiling xylene, extraction time: 3 hours, mesh: 325).¹

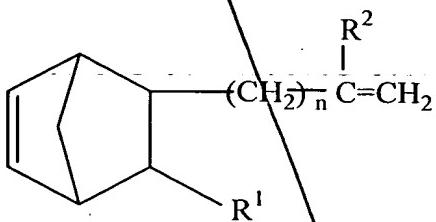
10. The crosslinkable rubber composition as claimed in claim 3 or 4, wherein the catalyst (E) is a platinum catalyst.

11. The crosslinkable rubber composition as claimed in any one of claims 2 to 10, which has the physical properties defined in claim 1.

12. The crosslinkable rubber composition as claimed
in any one of claims 1 to 11, which has a crosslinking
rate ($t_c(90)$) at 160°C of not more than 15 minutes.

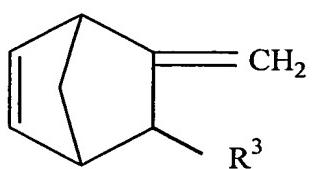
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13. The crosslinkable rubber composition as claimed
in any one of claims 1 to 12, which comprises
an ethylene/ α -olefin/non-conjugated polyene random
copolymer rubber (A1) having constituent units derived
from at least one kind of a vinyl end group-containing
norbornene compound represented by the following formula
(I) or (II), said norbornene compound being the non-
conjugated polyene, and constituent units derived from a
non-conjugated polyene compound (2) containing a group
represented by the following formula (III); and
the SiH group-containing compound (B) having at
least two SiH groups in one molecule:



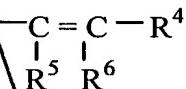
(I)

wherein n is an integer of 0 to 10, R¹ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R² is a hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



(II)

wherein R³ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms;



(III)

wherein R⁴ is an alkyl group of 1 to 10 carbon atoms, and R⁵ and R⁶ are each independently a hydrogen atom or an alkyl group of 1 to 10 carbon atoms.

14. The crosslinkable rubber composition as claimed in any one of claims 2 to 13, wherein the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A)

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is the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A1) and has the following properties:

- (i) the molar ratio (ethylene/ α -olefin) of ethylene to an α -olefin of 3 to 20 carbon atoms is in the range of 40/60 to 95/5,
- (ii) the iodine value is in the range of 0.5 to 50,
- (iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 10 dl/g, and
- (iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

15. The crosslinkable rubber composition as claimed in any one of claims 2 to 13, which is a blend comprising the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A), a polyolefin resin (D1) and the SiH group-containing compound (B), is obtained by microdispersing the polyolefin resin (D1) in the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) in a molten state, and has the following properties:

- the average dispersed particle diameter of the polyolefin resin (D1) is not more than 2 μm , and
- the blending weight ratio ((D1)/(A)) of the polyolefin resin (D1) to the ethylene/ α -olefin/non-

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conjugated polyene random copolymer rubber (A) is in the range of 5/95 to 50/50.

16. The crosslinkable rubber composition as claimed 5 in claim 15, which is a blend comprising the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A), a polyolefin resin (D1) selected from crystalline homopolymers of α-olefin having 3 to 8 carbon atoms and crystalline α-olefin copolymers of said α-olefins and the 10 SiH group-containing compound (B), is obtained by microdispersing the polyolefin resin (D1) in the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) in a molten state, and has the following properties:
- 15 the average dispersed particle diameter of the polyolefin resin (D1) is not more than 2 μm,
- the blending weight ratio ((D1)/(A)) of the polyolefin resin (D1) to the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) is in the 20 range of 5/95 to 50/50, and
- the hardness (Y) (A hardness defined by JIS K 6301) of said rubber composition and the amount (X) of the polyolefin resin (D1) satisfy the following relation

$$Y = (0.5 \pm 0.2)X + a$$

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wherein X is an amount (part(s) by weight, the total of the components (A) and (D) is 100 parts by weight) of the polyolefin resin (D1), and a is a hardness obtained by subtracting an increase of hardness attributed to the

- 5 addition of the polyolefin resin (D1) from the hardness of the rubber composition).

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17. The crosslinkable rubber composition as claimed in any one of claims 2 to 12, 15 and 16, wherein the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

(i) the molar ratio (ethylene/ α -olefin) of ethylene to an α -olefin of 3 to 20 carbon atoms is in the range of 40/60 to 95/5,

15 (ii) the iodine value is in the range of 0.5 to 50,

(iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 10 dl/g, and

(iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

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18. The crosslinkable rubber composition as claimed in any one of claims 2 to 13, which further comprises an alkenyl group-containing organopolysiloxane (C) in addition to the ethylene/ α -olefin/non-conjugated polyene

random copolymer rubber (A) and the SiH group-containing compound (B).

19. The crosslinkable rubber composition as claimed in any one of claims 2 to 12 and 18, wherein the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

- 5 (i) the molar ratio (ethylene/α-olefin) of ethylene to an α-olefin of 3 to 20 carbon atoms is in the range of
10 40/60 to 95/5,
10 (ii) the iodine value is in the range of 0.5 to 50,
10 (iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 10 dl/g, and
15 (iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

20. The crosslinkable rubber composition as claimed in any one of claims 2 to 12, 18 and 19, which is crosslinkable by hot air and has the following
20 properties:

a hot-air crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then subjecting the sheet to hot-air crosslinking has no scratch on the surface in a pencil hardness test using a
25 pencil of HB and has a compression set (CS) of not more

than 70 % after a heat treatment at 150°C for 22 hours and a tensile strength retention of 50 to 300 % after heat aging at 150°C for 72 hours.

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21. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing an automobile weatherstrip.

22. The crosslinkable rubber composition as claimed
10 in claim 21, wherein the automobile weatherstrip is a door weatherstrip, a trunk weatherstrip, a luggage weatherstrip, a roof side rail weatherstrip, a slide door weatherstrip, a ventilator weatherstrip, a sliding loop panel weatherstrip, a front window weatherstrip, a rear window weatherstrip, a quarter window weatherstrip, a lock pillar weatherstrip, a door glass outer weatherstrip, a door glass inner weatherstrip, a dam windshield, a glass run channel, a door mirror bracket, a seal head lamp or a seal cowl top.

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23. An automobile weatherstrip formed from the crosslinkable rubber composition of any one of claims 1 to 12.

24. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is a rubber composition for glass run that is crosslinkable by hot air and a hot press and which has the following properties:

- a hot-press crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then subjecting the sheet to hot-press crosslinking has a tensile strength of 5 to 16 MPa and a compression set (CS) of not more than 70 % after a heat treatment at 150°C for 22 hours.

25. The crosslinkable rubber composition as claimed in any one of claims 2 to 12, which is a crosslinkable rubber composition for glass run and in which the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

- (i) the molar ratio (ethylene/α-olefin) of ethylene to an α-olefin of 3 to 20 carbon atoms is in the range of 60/40 to 80/20,
- (ii) the iodine value is in the range of 1 to 30,
- (iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 1.5 to 3.5 dl/g, and
- (iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

26. The automobile weatherstrip as claimed in claim 23, which is a glass rubber product formed from the rubber composition of any one of claims 1 to 12, 24 and 25.

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27. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing an automobile hose, a water supply hose or a gas hose.

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28. The crosslinkable rubber composition as claimed in claim 27, wherein the automobile hose is a brake hose, a radiator hose, a heater hose or an air cleaner hose.

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29. A hose formed from the crosslinkable rubber composition of any one of claims 1 to 12.

30. The hose as claimed in claim 29, which is an automobile hose, a water supply hose or a gas hose.

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31. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is a rubber composition for hose that is crosslinkable by hot air and a hot press and which has the following properties:

a hot-press crosslinked rubber sheet obtained by

25 molding said rubber composition into a sheet and then

subjecting the sheet to hot-press crosslinking has a volume resistivity (23°C) of 10^3 to 10^{16} Ω·cm, a tensile strength of 5 to 30 MPa and a compression set (CS) of not more than 70 % after a heat treatment at 150°C for 22 hours.

10 32. The crosslinkable rubber composition as claimed in any one of claims 2 to 12, which is a crosslinkable rubber composition for hose and in which the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

15 (i) the molar ratio (ethylene/α-olefin) of ethylene to an α-olefin of 3 to 20 carbon atoms is in the range of 60/40 to 80/20,

15 (ii) the iodine value is in the range of 1 to 30,

(iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 5.0 dl/g, and

20 (iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

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33. A hose comprising the rubber composition of claim 31 or 32.

25 34. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing

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an automobile rubber vibration insulator, a railway rubber vibration insulator, an industrial equipment rubber vibration insulator or an earthquake proof rubber for construction.

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35. The crosslinkable rubber composition as claimed in claim 34, wherein the automobile rubber vibration insulator is an engine mount, a liquid seal engine mount, a damper pulley, a chain damper, a carburetor mount, a torsional damper, a strut mount, a rubber bush, a bumper rubber, a helper rubber, a spring sheet, a shock absorber, an air spring, a body mount, a bumper guard, a muffler support, a rubber coupling, a center bearing support, a clutch rubber, a deaf mount, a suspension bush, a slide bush, a cushion strut bar, a stopper, a handle damper, a radiator supporter or a muffler hanger.

36. The crosslinkable rubber composition as claimed in claim 34, wherein the railway rubber vibration insulator is a slab mat, a ballast mat or a track mat.

37. The crosslinkable rubber composition as claimed in claim 34, wherein the industrial equipment rubber vibration insulator is an expansion joint, a flexible joint, a bush or a mount.

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38. A rubber vibration insulator comprising the crosslinkable rubber composition of any one of claims 1 to 12.

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39. The rubber vibration insulator as claimed in claim 38, which is an automobile rubber vibration insulator, a railway rubber vibration insulator, an industrial equipment rubber vibration insulator or an 10 earthquake proof rubber for construction.

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40. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is a rubber composition for rubber vibration insulator that is

15 crosslinkable by hot air and a hot press and which has the following properties:

at hot-press crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then subjecting the sheet to hot-press crosslinking has a 20 tensile strength of 5 to 16 MPa and a compression set (CS) of not more than 70 % after a heat treatment at 150°C for 22 hours.

41. The crosslinkable rubber composition as claimed 25 in any one of claims 2 to 12, which is a crosslinkable

rubber composition for rubber vibration insulator and in which the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

- (i) the molar ratio (ethylene/α-olefin) of ethylene to an α-olefin of 3 to 20 carbon atoms is in the range of 60/40 to 80/20,
- (ii) the iodine value is in the range of 1 to 30,
- (iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 1.5 to 3.5 dl/g, and
- (iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

42. A vibration insulating rubber product formed from the rubber composition of claim 40 or 41.

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43. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing a transmission belt or a conveyor belt.

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44. The crosslinkable rubber composition as claimed in claim 43, wherein the transmission belt is a V-belt, A flat belt or a synchronous belt.

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45. The crosslinkable rubber composition as claimed in claim 43, wherein the conveyor belt is a light

conveyor belt, a cylindrical belt, a rough top belt, a flanged conveyor belt, a U-type guided conveyor belt or a V guided conveyor belt.

Subs 7 46. A belt formed from the crosslinkable rubber composition of any one of claims 1 to 12.

47. The belt as claimed in claim 46, which is a transmission belt or a conveyor belt.

Subs 10 48. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing an automobile cup/sealing material or an industrial equipment sealing material.

Subs 15 49. The crosslinkable rubber composition as claimed in claim 48, wherein the automobile cup/sealing material is a master cylinder piston cup, a wheel cylinder piston cup, a uniform motion joint boot, a pin boot, a dust cover, a piston seal, a packing, an O-ring or a diaphragm.

50. The crosslinkable rubber composition as claimed in claim 48, wherein the industrial equipment sealing material is a condenser packing, an O-ring or a packing.

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51. A sealing material formed from the crosslinkable rubber composition of any one of claims 1 to 12.

5 52. The sealing material as claimed in claim 51, which is an automobile cup sealing material or an industrial equipment sealing material.

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10 53. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing an automobile weatherstrip sponge or another expanded product.

15 54. The crosslinkable rubber composition as claimed in claim 53, wherein the automobile weatherstrip sponge is a door weatherstrip sponge, a bonnet weatherstrip sponge, a trunk room weatherstrip sponge, a sunshine roof weatherstrip sponge, a ventilator weatherstrip sponge or a corner sponge.

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55. The crosslinkable rubber composition as claimed in claim 53, wherein the another expanded product is a hose-protecting sponge, a cushioning sponge, a heat insulating sponge or an insulation pipe.

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56. An expanded product formed from the crosslinkable rubber composition of any one of claims 1 to 12.

5 57. The expanded product as claimed in claim 56, which is an automobile weatherstrip sponge.

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58. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is a rubber composition for weatherstrip sponge that is crosslinkable by hot air and which has the following properties:

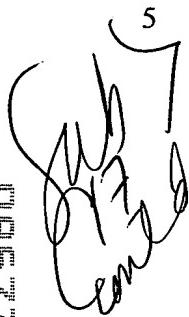
10 a crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then subjecting the sheet to hot-air crosslinking has a specific gravity of 15 0.1 to 0.8 and a water absorption of not more than 50 %.

59. The crosslinkable rubber composition as claimed in any one of claims 2 to 12, which is a rubber composition for weatherstrip sponge and in which the 20 ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

(i) the molar ratio (ethylene/ α -olefin) of ethylene to an α -olefin of 3 to 20 carbon atoms is in the range of 60/40 to 90/10,

25 (ii) the iodine value is in the range of 1 to 30,

(iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 5 dl/g, and
(iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 3.



5 60. A weatherstrip sponge formed from the crosslinkable rubber composition of any one of claims 1 to 12, 58 and 59.

10 61. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is a rubber composition for highly expanded sponge that is crosslinkable by hot air and which has the following properties:

15 an expanded product of a crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then subjecting the sheet to hot-air crosslinking has a specific gravity of 0.01 to 0.5, a water absorption of 1 to 500 % and an Asker C hardness of 0.1 to 50.

20 62. The crosslinkable rubber composition as claimed in any one of claims 2 to 12, which is a crosslinkable rubber composition for highly expanded sponge and in which the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

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~~(i) the molar ratio (ethylene/α-olefin) of ethylene to an α-olefin of 3 to 20 carbon atoms is in the range of 60/40 to 90/10,~~

~~(ii) the iodine value is in the range of 1 to 30,~~

~~(iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 4 dl/g, and~~

~~(iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.~~

10 63. A highly expanded sponge formed from the rubber composition of any one of claims 1 to 12, 61 and 62.

15 64. The highly expanded sponge as claimed in claim 63, which is a heat insulating sponge, a cushioning sponge, a sealing sponge or a flame-retardant sponge.

20 65. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing a covered electric wire, an electric wire joint or an electric insulating part.

66. A covered electric wire covered with a covering material comprising the crosslinkable rubber composition of any one of claims 1 to 12.

67. An electric wire joint formed from the crosslinkable rubber composition of any one of claims 1 to 12.

5 68. An electric insulating part formed from the crosslinkable rubber composition of any one of claims 1 to 12.

10 69. A semi-conducting rubber part formed from the crosslinkable rubber composition of any one of claims 1 to 12.

15 70. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is a rubber composition for electric or electronic part that is crosslinkable by hot air and a hot press and which has the following properties:

a hot-press crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then 20 subjecting the sheet to hot-press crosslinking has a volume resistivity (23°C) of 10^7 to 10^{17} $\Omega \cdot \text{cm}$, a tensile strength of 3 to 20 MPa and a compression set (CS) of not more than 70 % after a heat treatment at 150°C for 22 hours.

71. The crosslinkable rubber composition as claimed in any one of claims 2 to 12, which is a crosslinkable rubber composition for electric or electronic part and in which the ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) has the following properties:

(i) the molar ratio (ethylene/ α -olefin) of ethylene to an α -olefin of 3 to 20 carbon atoms is in the range of 60/40 to 90/10,

(ii) the iodine value is in the range of 1 to 30,

10 (iii) the intrinsic viscosity (η) as measured in
decalin at 135°C is in the range of 0.3 to 2.5 dl/g, and

(iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

15 72. An electric or electronic part formed from the
crosslinkable rubber composition of any one of claims 1
to 12, 70 and 71.

73. The crosslinkable rubber composition as claimed
in any one of claims 1 to 12, which is used for producing
a household rubber product.

74. The crosslinkable rubber composition as claimed
in claim 73, wherein the household rubber product is rain
wear, rubber band, shoe, rubber glove, latex or golf ball.
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75. The crosslinkable rubber composition as claimed
in any one of claims 2 to 12, which can be crosslinked at
ordinary temperature.

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76. The crosslinkable rubber composition as claimed
in any one of claims 2 to 12, which is used for reaction
injection molding (RIM).

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77. The crosslinkable rubber composition as claimed
in any one of claims 2 to 12, which is used for producing
a thermoplastic elastomer.

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78. The crosslinkable rubber composition as claimed
in any one of claims 2 to 12, which is used for modifying
an engineering plastic.

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79. A household rubber product formed from the

crosslinkable rubber composition of any one of claims 1

to 12.

80. The crosslinkable rubber composition as claimed
in any one of claims 1 to 12, which is used for producing
a sealing sponge for construction.

81. The crosslinkable rubber composition as claimed in claim 80, wherein the sealing sponge for construction is a sealing sponge for gasket, airtight, joint or door stop.

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82. The expanded product as claimed in claim 56, which is a sealing sponge for construction.

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83. The crosslinkable rubber composition as claimed in any one of claims 1 to 12, which is used for producing an OA machine roll or an industrial roll.

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84. The crosslinkable rubber composition as claimed in claim 83, wherein the OA machine roll is an electric charge roll, a transfer roll, a developing roll or a paper feed roll.

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85. The crosslinkable rubber composition as claimed in claim 83, wherein the industrial roll is an iron manufacturing roll, a paper manufacturing roll or a printing electric wire roll.

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86. An OA machine roll comprising the crosslinkable rubber composition of any one of claims 1 to 12.

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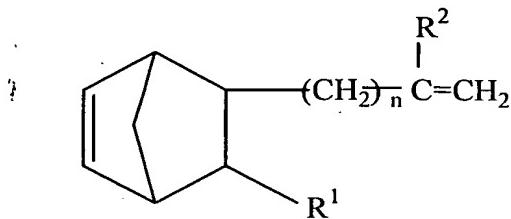
87. An industrial roll formed from the crosslinkable rubber composition of any one of claims 1 to 12.

- 5 88. A crosslinkable rubber composition for hydraulic cylinder seal, which is crosslinkable by hot air and a hot press and has the following properties:
- a hot-air crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then
- 10 subjecting the sheet to hot-air crosslinking has no scratch on the surface in a pencil hardness test using a pencil of HB, and
- a hot-press crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then
- 15 subjecting the sheet to hot-press crosslinking has the following properties:
- (1) the compression set (CS) after a heat treatment at 150°C for 22 hours is not more than 70 %,
- (2) the volume change (ΔV) after immersion in a DOT-
20 3 brake liquid at 150°C for 70 hours is in the range of - 10 to +50 %,
- (3) the tensile strength retention after heat aging at 150°C for 70 hours is in the range of 50 to 150 % and the elongation retention after the same heat aging is not
25 less than 50 %, and

(4) the dry tensile strength is in the range of 3 to 25 MPa.

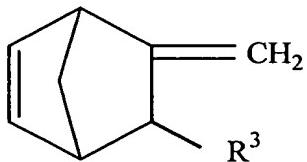
89. The rubber composition for hydraulic cylinder seal as claimed in claim 88, which comprises an ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) having constituent units derived from at least one kind of a vinyl end group-containing norbornene compound represented by the following formula (I) or (II), said norbornene compound being the non-conjugated polyene, and a SiH group-containing compound (B) having at least two SiH groups in one molecule, and which has a crosslinking rate ($t_c(90)$) at 160°C of not more than 15 minutes;

15



(I)

wherein n is an integer of 0 to 10, R^1 is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R^2 is a hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



(II)

5 wherein R^3 is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms.

90. The rubber composition for hydraulic cylinder seal as claimed in claim 89, wherein the ethylene/ α -
10 olefin/non-conjugated polyene random copolymer rubber (A)
has the following properties:

(i) the molar ratio (ethylene/ α -olefin) of ethylene to an α -olefin of 3 to 20 carbon atoms is in the range of 50/50 to 75/25,
15 (ii) the iodine value is in the range of 1 to 30,
(iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 2.5 dl/g, and
(iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

20

91. The rubber composition for hydraulic cylinder seal as claimed in claim 89, which further comprises a

catalyst (E) in addition to the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) and the SiH group-containing compound (B) having at least two SiH groups in one molecule.

5

92. The rubber composition for hydraulic cylinder seal as claimed in claim 91, which further comprises a reaction inhibitor (F) in addition to the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A),
10 the SiH group-containing compound (B) having at least two SiH groups in one molecule and the catalyst (E).

93. The rubber composition for hydraulic cylinder seal as claimed in claim 91 or 92, wherein the catalyst
15 (E) is a platinum catalyst.

94. A hydraulic cylinder part formed from the rubber composition of any one of claims 88 to 93.
20 95. A crosslinkable rubber composition for seal packing, which is crosslinkable by hot air and a hot press and has the following properties:
a hot-air crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then
25 subjecting the sheet to hot-air crosslinking has no

scratch on the surface in a pencil hardness test using a pencil of HB, and

a hot-press crosslinked rubber sheet obtained by molding said rubber composition into a sheet and then

- 5 subjecting the sheet to hot-press crosslinking has the following properties:

(1) the compression set (CS) after a heat treatment at 150°C for 22 hours is not more than 70 %,

- 10 (2) the volume change (ΔV) after immersion in an ethylene glycol solution at 120°C for 70 hours is in the range of -20 to +20 %,

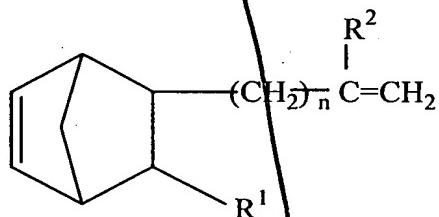
- 15 (3) the tensile strength retention after heat aging at 150°C for 70 hours is in the range of 50 to 150 %, the elongation retention after the same heat aging is not less than 50 %, and the hardness change after the same heat aging is in the range of 0 to +50 points,

(4) the dry tensile strength is in the range of 3 to 20 MPa, and

- 20 (5) the number of shots at which staining on the mold takes place in a mold stain test is not less than 30.

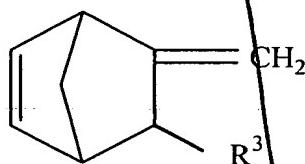
96. The rubber composition for seal packing as claimed in claim 95, which comprises an ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A) having constituent units derived from at least one kind

- of a vinyl end group-containing norbornene compound represented by the following formula (I) or (II), said norbornene compound being the non-conjugated polyene, and a SiH group-containing compound (B) having at least two 5 SiH groups in one molecule, and which has a crosslinking rate ($t_c(90)$) at 160°C of not more than 15 minutes;



(I)

- 10 wherein n is an integer of 0 to 10, R¹ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R² is a hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



(II)

15

wherein R³ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms.

97. The rubber composition for seal packing as claimed in claim 96, wherein the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) has the
5 following properties:

- (i) the molar ratio (ethylene/α-olefin) of ethylene to an α-olefin of 3 to 20 carbon atoms is in the range of 60/40 to 85/15,
10 (ii) the iodine value is in the range of 0.5 to 30,
(iii) the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.3 to 3.0 dl/g, and
(iv) the branch index as measured by a kinematic viscoelasticity measuring machine is not less than 5.

15 98. The rubber composition for seal packing as claimed in claim 96, which further comprises a catalyst (E) in addition to the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A) and the SiH group-containing compound (B) having at least two SiH groups in
20 one molecule.

99. The rubber composition for seal packing as claimed in claim 98, which further comprises a reaction inhibitor (F) in addition to the ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A), the SiH
25

group-containing compound (B) having at least two SiH groups in one molecule and the catalyst (E).

100. The rubber composition for seal packing as
5 claimed in claim 98 or 99, wherein the catalyst (E) is a platinum catalyst.

101. A seal packing part formed from the rubber composition of any one of claims 95 to 100.

10

102. A rubber composition for constructional gasket, comprising:

5 to 100 parts by weight of an ethylene/ α -olefin/non-conjugated polyene random copolymer rubber (A)
15 having constituent units derived from at least one kind of a vinyl end group-containing norbornene compound represented by the following formula (I) or (II), said norbornene compound being the non-conjugated polyene,

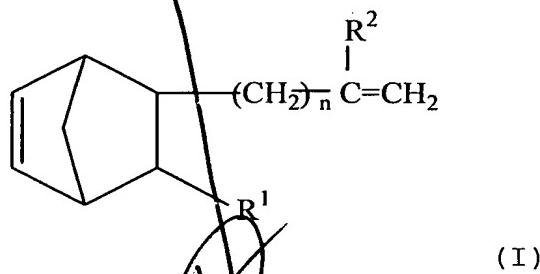
0 to 95 parts by weight of an organopolysiloxane (I)
20 represented by the following average composition formula (1),

a SiH group-containing compound (B1) having at least two SiH groups in one molecule in such an amount as gives 0.2 to 5 hydrogen atoms bonded to silicon atoms based on

one aliphatic unsaturated bond in the component (A) and the component (I), and

a platinum group metal catalyst (E1) in a catalytic amount,

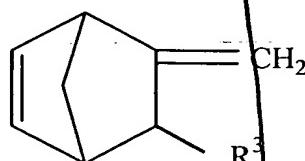
- 5 with the proviso that the total amount of the component (A) and the component (I) is 100 parts by weight;



(I)

10

wherein n is an integer of 0 to 10, R^1 is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R^2 is a hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



(II)

15

wherein R³ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms;



5

wherein R¹ is an unsubstituted or substituted mono-valent hydrocarbon group, and n is a positive number of 1.95 to 2.05.

10 103. The rubber composition for constructional gasket as claimed in claim 102, which further comprises 0.5 to 30 parts by weight of a blowing agent based on 100 parts by weight of the total of the component (A) and the component (I).

15

104. A constructional gasket comprising a cured product of an olefin rubber composition which comprises:

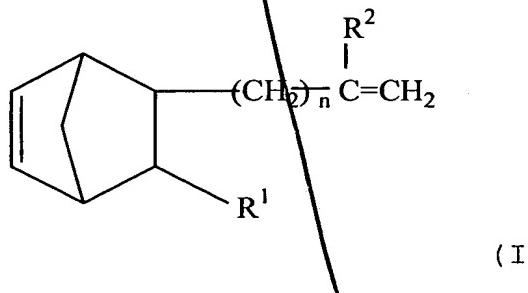
5 to 100 parts by weight of an ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A)
20 having constituent units derived from at least one kind of a vinyl end group-containing norbornene compound represented by the following formula (I) or (II), said norbornene compound being the non-conjugated polyene,

95 to 0 parts by weight of an organopolysiloxane (I) represented by the following average composition formula (1),

a SiH group-containing compound (B1) having at least 5 two SiH groups in one molecule in such an amount as gives 0.2 to 5 hydrogen atoms bonded to silicon atoms based on one aliphatic unsaturated bond in the component (A) and the component (I), and

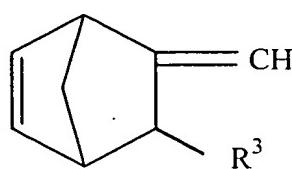
10 a platinum group metal catalyst (E1) in a catalytic amount,

with the proviso that the total amount of the component (A) and the component (I) is 100 parts by weight;



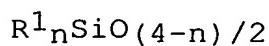
15

wherein n is an integer of 0 to 10, R¹ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R² is a hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



(II)

wherein R³ is a hydrogen atom or an alkyl group of 1 to
5 10 carbon atoms;



(1)

wherein R¹ is an unsubstituted or substituted mono-valent
10 hydrocarbon group, and n is a positive number of 1.95 to
2.05.

105. The constructional gasket as claimed in claim
104, which comprises a cured sponge of the olefin rubber
15 composition further comprising 0.5 to 30 parts by weight
of a blowing agent based on 100 parts by weight of the
total of the component (A) and the component (I).

106. A rubber composition for rubber roll,
20 comprising:

5 to 100 parts by weight of an ethylene/α-
olefin/non-conjugated polyene random copolymer rubber (A)
having constituent units derived from at least one kind
of a vinyl end group-containing norbornene compound

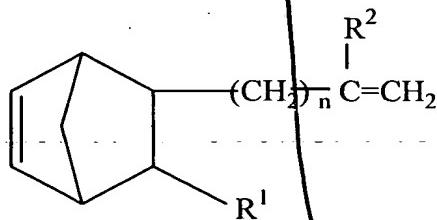
represented by the following formula (I) or (II), said norbornene compound being the non-conjugated polyene,

95 to 0 parts by weight of an organopolysiloxane (I) represented by the following average composition formula
5 (1),

a SiH group-containing compound (B1) having at least two SiH groups in one molecule in such an amount as gives 0.2 to 5 hydrogen atoms bonded to silicon atoms based on one aliphatic unsaturated bond in the component (A) and
10 the component (I), and

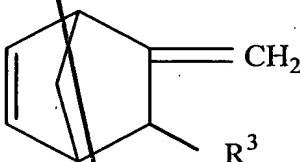
a platinum group metal catalyst (E1) in a catalytic amount,

with the proviso that the total amount of the component (A) and the component (I) is 100 parts by
15 weight;



(I)

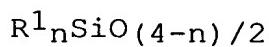
wherein n is an integer of 0 to 10, R¹ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R² is a hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



5

wherein R³ is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms;

10



(1)

wherein R¹ is an unsubstituted or substituted mono-valent hydrocarbon group, and n is a positive number of 1.95 to 15 2.05.

107. The rubber composition for rubber roll as claimed in claim 106, which further comprises a conductive material to impart conductivity or semi-conductivity to a cured rubber layer of the rubber composition.

108. The rubber composition for rubber roll as claimed in claim 106 or 107, which further comprises an organic peroxide.

5 109. A rubber roll obtained by forming a cured rubber layer of a rubber composition around a core bar, said rubber composition comprising:

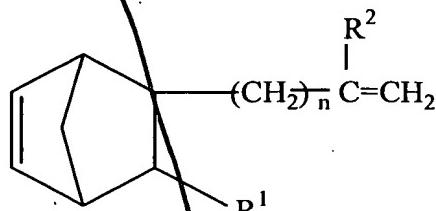
5 to 100 parts by weight of an ethylene/α-olefin/non-conjugated polyene random copolymer rubber (A)
10 having constituent units derived from at least one kind of a vinyl end group-containing norbornene compound represented by the following formula (I) or (II), said norbornene compound being the non-conjugated polyene,

95 to 0 parts by weight of an organopolysiloxane (I)
15 represented by the following average composition formula (1),

a SiH group-containing compound (B1) having at least two SiH groups in one molecule in such an amount as gives 0.2 to 5 hydrogen atoms bonded to silicon atoms based on
20 one aliphatic unsaturated bond in the component (A) and the component (I), and

a platinum group metal catalyst (E1) in a catalytic amount,

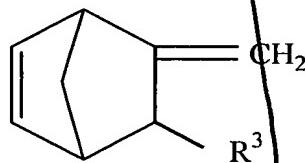
with the proviso that the total amount of the component (A) and the component (I) is 100 parts by weight;



5

(I)

wherein n is an integer of 0 to 10, R^1 is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms, and R^2 is a hydrogen atom or an alkyl group of 1 to 5 carbon atoms;



(II)

15

wherein R^3 is a hydrogen atom or an alkyl group of 1 to 10 carbon atoms;

 $R^1_n SiO(4-n)/2$

(1)

wherein R¹ is an unsubstituted or substituted mono-valent hydrocarbon group, and n is a positive number of 1.95 to 2.05.

5

110. The rubber roll as claimed in claim 109, wherein the rubber composition further comprises a conductive material so that the cured rubber layer has conductivity or semi-conductivity.

10

111. The rubber roll as claimed in claim 109 or 110, wherein the rubber composition further comprises an organic peroxide.

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